REMARKS

Reconsideration of this application is respectfully requested in view of the following remark.

Response to Rejections Under 35 U.S.C. § 103

1. Rejection of Claims 1-2, 8-12, and 18-20

The rejection of claims 1-2, 8-12, and 18-20 under 35 U.S.C. § 103(a) as being unpatentable over Sukkar (US 6292778) in view of Laurila et al. (US 6772117) is respectfully traversed on the grounds that the Sukkar and Laurila patents fail to disclose or suggest, whether considered individually or in any reasonable combination, the following features of the claimed invention:

- generation of *verification feature vectors* by **normalizing the feature vectors** using normalization parameters of the verification unit, as recited in part D of claim 1 (the Laurila patent, cited by the Examiner as disclosing "normalization," discloses that the "normalization" is used to compensate for the effects of noise rather than to adjust the dynamic range of feature vectors; moreover, the normalization parameters of Laurila are *dynamically calculated based on mean values and standard deviations of a normalization buffer rather than pre-obtained normalization parameters of the claim verification unit*); and

- utilizing a verification-unit corresponded classified to calculate the *verification score* based on the **input verification feature vectors** generated by normalizing the feature vectors, as recited in part E of claim 1(in the Sukkar patent, cited by the Examiner as

disclosing this limitation, the score said to be the "verification score" is actually determined as a <u>ratio</u> <u>of the likelihood that the speech segment contains the</u> <u>sound associated with a subword hypothesis to the</u> <u>likelihood that the speech segment consists of a</u> <u>different sound</u>, which does <u>not</u> correspond to the claimed verification score <u>obtained by inputting the</u> <u>normalized feature vectors to the verification-unit</u> <u>corresponded classifier</u>).

Because the claimed normalization is different from that of Laurila and the claimed verification score is also different from that of Sukkar, it is respectfully submitted that the proposed combination of teachings from Laurila and Sukkar would not have resulted in the claimed invention.

Laurila discloses normalization to compensate the effects of noise (col. 2, lines 12-16) for improving speech recognition, and the normalization is carried out by sliding the mean values and standard deviations of the normalization buffer (col. 2, lines 16-21; Fig. 5). To accomplish this, the mean values and standard deviations used are dynamically calculated and obtained (col. 4, lines 6-43; Fig. 4). In contrast, the normalization recited in the claims uses "normalization parameters of the verification unit" corresponding to the speech segment for adjusting the dynamic range of feature vectors, which are pre-obtained and pre-stored in a database as explained on page 7, line 10-page 8, line 7 of the original specification. The normalization disclosed by Laurila, which is used to compensate the effects of noise and improve speech recognition, is accordingly not the same as the claimed normalization, which is to adjust the dynamic range of feature vectors as recited in claim 1. Both Laurila and Sukkar use normalization, but they do not normalize the same values for the same purpose.

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Further, turning to the Sukkar patent, the verification scores disclosed by Sukkar are determined as a ratio of the likelihood that the speech segment contains the sound associated with the subword hypothesis to the likelihood that the speech segment consists of a different sound (col. 10, line 66 to col. 11, line 3). Namely, the verification score is a likelihood score ratio of the sound associated with the subword hypothesis and the speech segment consisting of a different sound. In contrast, the verification score of the invention is obtained by inputting the normalized feature vectors to the verification-unit corresponded classifier, which is completely different and not analogous to the verification score of Sukkar.

Since the claimed normalization is different from that of Laurila (and is not taught by Sukkar), and since the claimed verification score has nothing to do with that of Sukkar (and is not taught by Laurila), it is respectfully submitted that the rejection of claim 1 under 35 USC 103(a) is improper and should be withdrawn.

With regard to claims 2 and 12, the applicants respectfully note that the means and standard deviations of the claimed invention are used to *normalize the feature vectors*, whereas the adjusting parameters disclosed by Sukkar are the model parameters in HMM for *estimating the subword hypothesis' likelihood*. Clearly, the means and standard deviations are applied differently in the invention and Sukkar.

With regard to claims 9-10 and 19-20, the training data used for training the MLPs in the invention are pre-corrupted by noise with different power levels of SNR (for example, the speech segments corrupted by in-car noise with SNRs of 9dB, 3dB, 0dB, -3dB, and -9dB are used to train the MLPs; see page 11, lines 9-17). However, only a certain

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amount of noise is given in training by Sukkar, which is different from the present invention and has a poor performance in comparison with the MLP training provided by the invention. Similarly, Laurila discloses a method for compensating the effects of noise and increasing the effect of speech recognition, which compares the method with the other methods at 5, 0, -5, -10 dB SNR (col. 6, lines 6-37) and is different from the invention, which directly experiences the telephone speech at the different SNRs but does not compare with the other methods.

In order to appreciate the advantage of the present invention, one can use a known method (Sukkas, R.A., "Subword-based Minimum Verification Error (SB-MVE) Training for Task Independent Utterance Verification" Proc. ICASSP'98, 1998) to receive a noise-corrupted speech signal for implementing verification, and compare it with the present invention to see the difference therebetween. The result can be seen in the supplementary document "MLP-BASD UTTERANCE VERIFICATION FOR IN-CAR SPEECH RECOGNITION", Proceedings of Oriental COCOSDA, which was attached to the previous response. Briefly, the invention can provide good speech recognition when the environment is changed, and especially when it is changed to a heavy noise environment.

Accordingly, the subject matter of claims 1-2, 8-12 and 18-20 is not suggested by any reasonable combination of the Sukkar and Laurila patents.

2. Rejection of Claims 3-7 and 13-17

This rejection is respectfully traversed on the grounds that the Carey patent (US 5526465), like the Laurila and Sukkar patents, fails to disclose or suggest the claimed **normalization of feature vectors** or calculation of a *verification score* by **inputting the sequence of verification feature vectors** obtained by normalizing the feature vectors.

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Furthermore, whereas the invention uses an MLP neural network as the classifier for changing the normalized feature vectors into the verification score, Carey uses the neural network for *increasing discrimination between the personal model and the world model*, as described in col. 11, lines 15-20 of the Carey patent.

In addition, Carey uses a Baum-Welch backward pass algorithm and the likelihood information in MLP training in order to increase discrimination between the personal model and the world model, whereas the claimed invention uses an error back-propagation algorithm and the information of sequences of verification feature vectors in MLP training in order to generate the verification scores.

Moreover, Carey requires two values Pp and Pw for speaker utterance training (col. 11, line 60 to col. 12, line 7), but the invention only uses the target value for speech segment training.

Accordingly, the dependent claims 3-7 and 13-17 are different from Carey, Laurila and Sukkar, and patentable, even when the three references are considered in combination.

CONCLUSION

In view of the foregoing remarks, reconsideration and allowance of the application are now believed to be in order, and such action is hereby solicited. If any points remain in issue that the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned attorney at the telephone number listed below.

Respectfully submitted,

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Date: November 5, 2007

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